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CHAPTER 9

# Prices and Wages

Writers who believe that, in the economy at large, profits per unit of business done tend to deteriorate at some time during expansion and to improve in contraction do not rest their views entirely on supposed variations in the physical relation of input to output. In some industries or sectors of the economy, they suppose, the prices received by business enterprises in expansion rise less rapidly than the prices and wage rates paid; in contraction, prices received fall less than prices and wage rates paid. In the case of railroads and public utilities, it is sometimes thought, governmental regulation of prices received results in inflexibility and hence makes disturbances of price-wage relations particularly likely.

## PRICES RECEIVED DID NOT RISE AND FALL WITH TRAFFIC OR BUSINESS ACTIVITY

### *Unit revenue must be our guide*

In the railroad industry 'prices received' means, principally, freight rates and passenger fares. At any moment there must be literally millions of them in the tariffs. Questions about their cyclical variation therefore have to be phrased in terms of some kind of an average or index. Ideally, perhaps, such an index should be computed by multiplying every rate, fare, or other charge in effect on any specified date by the amount of traffic that moved under the comparable rate in some base period, totaling the resulting products, and expressing the total as a percentage of aggregate revenue in the base period. To follow this procedure in exact detail would be utterly impracticable although, for recent years, an approximation to it would be possible after much research. While various investigators have constructed indexes of freight rates for various periods and segments of traffic, no one has yet devised a reliable and comprehensive index for all freight rates, let alone one for freight rates, passenger fares, and all the miscellaneous kinds of railway charges. The nearest equivalent is a series of annual or monthly ratios we have computed by dividing traffic units into

total operating revenue. We call the result 'revenue per traffic unit'.

Any widespread and substantial change in railway charges must affect this average. But the figure is affected also by something else—changes in the composition of traffic. Different commodities, moving over the same stretch of railway, pay different rates and hence yield different earnings per ton-mile. Rates on any one commodity, although they usually rise with distance, seldom rise proportionately; hence one shipment, moving a short distance, will pay higher revenue per ton-mile than another shipment of the same commodity moving a longer distance in the same general area. Rates in the South and West are sometimes higher than in the East; a shipment moving in one territory not infrequently yields more revenue per ton-mile than a similar shipment moving the same distance in another. Hence revenue per ton-mile is affected by the composition of traffic, distances of movement, and the proportion of movement occurring in different parts of the country. Analogous remarks apply to revenue per passenger-mile. Revenue per traffic unit is influenced by changes not only in the composition of freight traffic and of travel but also in the relative importance of ton-miles, passenger-miles, and other sources of receipts.

The importance of changes in composition, however, can easily be exaggerated. From data for 1929 and 1932 we can determine how a major cyclical change in composition by commodities, without any change in the unit revenue derived from any one of them, would affect the average unit revenue derived from all carload traffic, which contributes roughly 70 percent of total operating revenue. The hypothetical ton-miles shown in Table 77, even though we have used 1932 average hauls in computing them, must bear a considerable resemblance in composition to the actual 1929 ton-miles, for we have used the 1929 tonnages.[1] The shift in commodity make-up from a hypothetical 1929-like year to the actual year 1932 does not raise the unit revenue from the entire carload traffic; indeed it lowers the figure a trifle, from 1.0350 to 1.0308 cents.

Revenue per unit for *all* freight traffic could be affected also by changes in the relative importance of less-than-carload ton-miles,

[1] As noted in Chapter 1, the only year within our period for which data on ton-miles by commodities are available is 1932.

unit revenue from which must be comparatively high. But only 10.6 percent of the freight revenue came from this source in 1928 (the first year for which there are data). Thereafter the percentage diminished fairly steadily to 5.1 in 1944. (In earlier years, however, the figure was probably somewhat higher than 10.6.)

Table 77

Effect of Change in Composition of Carload Traffic on Revenue per Ton-mile: Illustrative Computations

| Commodity | Wheat | Coke | Automobiles | All (156) |
|---|---|---|---|---|
| (1) Tons originated, 1929 (thousands)[a] | 27,019 | 19,167 | 3,694 | 1,303,048 |
| (2) Average haul, 1932 (miles)[b] | 219.31 | 182.44 | 822.53 | 322.92 |
| (3) Hypothetical ton-miles, (1) x (2) (millions) | 8,627 | 3,489 | 3,038 | 420,772[c] |
| (4) Revenue per ton-mile; 1932 (cents) | 1.0470 | 1.1367 | 3.7405 | 1.0308[d] |
| (5) Hypothetical revenue, (3) x (4) ($000)[a] | 90,325 | 39,659 | 113,636 | 4,354,966[c] |

[a] A larger number of digits was used in the actual computations.

[b] Federal Coordinator of Transportation, *Freight Traffic Report*, App. I, pp. 74, 75.

[c] Sum of 156 products similar to those illustrated.

[d] Actual figure for 1932 traffic. For the hypothetical traffic the figure is 1.0350 cents ($4,354,966 ÷ 420,772).

Without alteration in freight revenue per ton-mile or passenger revenue per passenger-mile, operating revenue per traffic unit could change because of a shift in the relative importance of freight movement and travel. How much would depend partly on the size of the shift and partly on the degree to which the ratio of revenue per passenger-mile to revenue per ton-mile diverges from 2.4, the factor by which we equate passenger-miles to ton-miles. Even if we make rather extreme assumptions concerning both, however, revenue per traffic unit would be raised or lowered less than 2 percent.[2]

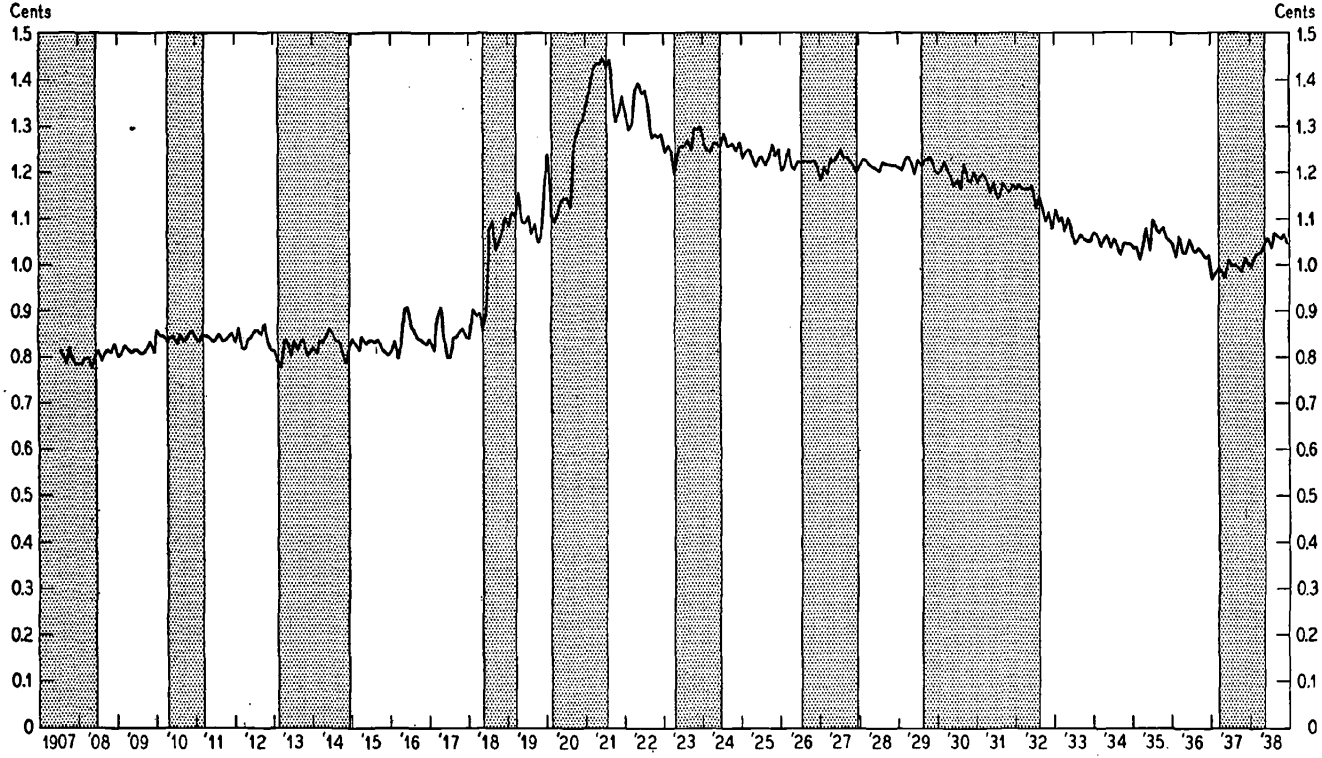
[2] In the first and second of two periods, respectively, let ton-miles equal $t_1$ and $t_2$, passenger-miles $r_1t_1$ and $r_2t_2$, operating revenue per traffic unit $P_1$ and $P_2$. Let freight revenue per ton-mile equal p and passenger revenue per passenger-mile ap in both periods. Assume that miscellaneous operating revenues either are zero or are the same percentage of freight plus passenger revenues in both periods. Then it can be proved that

$$\frac{P_2}{P_1} = \frac{\dfrac{1 + ar_2}{1 + 2.4r_2}}{\dfrac{1 + ar_1}{1 + 2.4r_1}}$$

The extent to which this expression departs from unity depends partly on the

CHART 95

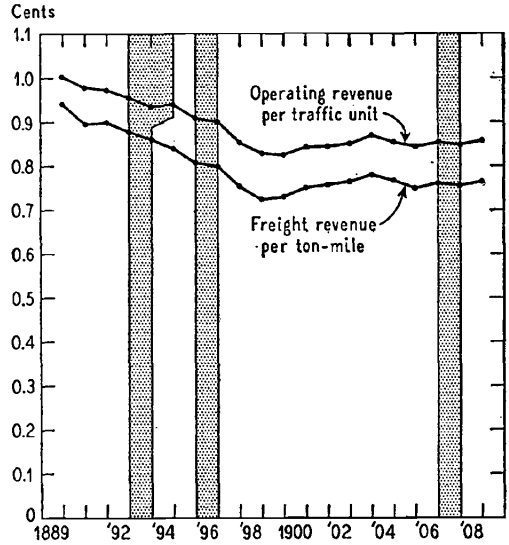
Operating Revenue per Traffic Unit, July 1907—December 1938




Shaded periods are contractions in traffic units.

CHART 96

Operating Revenue per Traffic Unit, and Freight Revenue per Ton-mile, 1890–1909




Shaded periods are contractions in traffic units and ton-miles (trough in former in 1895, in latter in 1894).

Although these tests are not exhaustive, they encourage us to believe that variations in composition are not likely to offset or conceal any substantial and general change in rates, fares, and other charges. Major fluctuations in the level of rates, etc., should be reflected in revenue per traffic unit.

*It did not even conform positively to traffic*

Yet when we examine the curve of unit revenue we fail to discern any clear-cut cycles bearing a systematic relation to those in traffic (Charts 95 and 96). In 4 of 8 phases of rising traffic after 1908 there was a net decline in revenue per unit, in 6 of 8 falling phases a net increase (Table 78). The computations, like those from earlier,

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difference between $r_1$ and $r_2$ and partly on that between a and 2.4. The largest change in the ratio of passenger-miles to ton-miles in any phase of traffic units was apparently a drop from .103 to .035 in 1921–29. Values of .12 for $r_1$ and .08 for $r_2$ therefore mean an extremely large shift. From 1882 to 1944 the value of a ranged from its maximum of 2.880 in 1917 to its minimum of 1.838 in 1940. Either 2.9 or 1.8 represents an extreme departure from 2.4. Substituting .12, .08, and 2.9 in the foregoing equation we get .988; substituting .12, .08, and 1.8 we get 1.017.

Table 78

Operating Revenue per Traffic Unit: Change per Month, 1908–38, and per Year, 1893–1913, between Peaks and Troughs in Traffic Units

| Turn in traffic units | | Months or years from prec. date | Revenue per traffic unit[a] | Change from preceding date | | | Conformity suggested[b] |
|---|---|---|---|---|---|---|---|
| | | | | Total | Per month or year | | |
| Date | Level | | | | To peak from trough | To trough from peak | |
| | | | (cents) | | | | |
| | | Months | | | Per month | | |
| June 1908 | Trough | ... | .7987 | ... | ... | ... | ... |
| Apr. 1910 | Peak | 22 | .8409 | .0422 | .0019 | ... | ... |
| Mar. 1911 | Trough | 11 | .8410 | .0001 | ... | .0000 | Positive |
| Feb. 1913 | Peak | 23 | .7924 | −.0486 | −.0021 | ... | Inverse |
| Dec. 1914 | Trough | 22 | .8160 | .0236 | ... | .0011 | Inverse |
| May 1918 | Peak | 41 | .8821 | .0661 | .0016 | ... | Positive |
| Mar. 1919 | Trough | 10 | 1.1251 | .2430 | ... | .0243 | Inverse |
| Feb. 1920 | Peak | 11 | 1.1455 | .0204 | .0019 | ... | Inverse |
| July 1921 | Trough | 17 | 1.4401 | .2946 | ... | .0173 | Inverse |
| Apr. 1923 | Peak | 21 | 1.2320 | −.2081 | −.0099 | ... | Inverse |
| June 1924 | Trough | 14 | 1.2669 | .0349 | ... | .0025 | Inverse |
| July 1926 | Peak | 25 | 1.2237 | −.0432 | −.0017 | ... | Inverse |
| Dec. 1927 | Trough | 17 | 1.2090 | −.0147 | ... | −.0009 | Inverse |
| Aug. 1929 | Peak | 20 | 1.2238 | .0148 | .0007 | ... | Positive |
| Aug. 1932 | Trough | 36 | 1.1299 | −.0939 | ... | −.0026 | Positive |
| Mar. 1937 | Peak | 55 | .9862 | −.1437 | −.0026 | ... | None |
| May 1938 | Trough | 14 | 1.0450 | .0588 | ... | .0042 | Inverse |
| | | Years | | | Per year | | |
| 1893 | Peak | ... | .9545 | ... | ... | ... | ... |
| 1895 | Trough | 2 | .9383 | −.0162 | ... | −.0081 | ... |
| 1896 | Peak | 1 | .9072 | −.0311 | −.0311 | ... | Inverse |
| 1897 | Trough | 1 | .8999 | −.0073 | ... | −.0073 | Inverse |
| 1907 | Peak | 10 | .8533 | −.0466 | −.0047 | ... | Positive |
| 1908 | Trough | 1 | .8460 | −.0073 | ... | −.0073 | Positive |
| 1913[c] | Peak | 5 | .8287 | −.0173 | −.0035 | ... | Inverse |

[a] Three-month average, 1908–38 section; date of turn is middle month.

[b] By comparison with preceding rate, e.g., .0000 with .0019.

[c] Annual data on traffic units, it should be remembered, reveal no 1910–11 contraction; consequently, in this section, the phase beginning in 1908 runs to 1913.

annual data suggest inverse conformity. Most of the net differences were rather small, percentagewise. (The irregular variation within each phase looks unusually large in comparison.) Altering composition may account for most of them; they do not prove that rates, fares, etc. actually declined in expansion or rose in contraction. But we can infer with reasonable certainty that the railroads did not regularly and materially *raise* their charges during the former or reduce them during the latter. For the understanding of price relations, this is the important fact.

Table 79

Freight Revenue per Ton-mile at Peaks and Troughs in Ton-miles, 1908–1938

| Turn in ton-miles | | Revenue per ton-mile[a] (cents) | Direction of change from prec. date | Turn in ton-miles | | Revenue per ton-mile[a] (cents) | Direction of change from prec. date |
|---|---|---|---|---|---|---|---|
| Date | Level | | | Date | Level | | |
| Feb. 1908 | Trough | .753 | ... | Feb. 1920 | Peak | .986 | ... |
| Mar. 1910 | Peak | .709 | − | July 1921 | Trough | 1.292 | + |
| Feb. 1911 | Trough | .720 | + | Apr. 1923 | Peak | 1.099 | − |
| May 1913 | Peak | .675 | − | June 1924 | Trough | 1.114 | + |
| Dec. 1914 | Trough | [b] | ... | July 1926 | Peak | 1.079 | − |
| Apr. 1918 | Peak | .705 | ... | Dec. 1927 | Trough | 1.100 | + |
| Mar. 1919 | Trough | .915 | + | Aug. 1929 | Peak | 1.084 | − |
| Feb. 1920 | Peak | .890 | − | July 1932 | Trough | 1.069 | − |
| | | | | Apr. 1937 | Peak | 0.933 | − |
| | | | | May 1938 | Trough | 0.994 | + |

[a] Three-month average; date of turn is middle month. Nonrevenue ton-miles included in divisor, 1908–20 section.
[b] No data.

When we consider freight and passenger earnings separately, we find that freight revenue per ton-mile showed a rather well defined inverse relation to traffic, at least after 1908. It fell in all 7 expansions in ton-miles for which we have monthly data, rose in all 7 contractions except 1929–32 (Table 79). Even in that instance, the rate of decline, .0004 cents per month, was less rapid than the rate in 1927–29, .0008 cents, or in 1932–37, .0024 cents. Comparisons involving earlier phases and based on annual data, however, somewhat reduce the consistency of the entire record: only 2 of 5 suggest inverse conformity (Table 80). Specific phases in revenue per ton-mile itself contain jiggly fluctuations from month to month that are rather large compared with the total specific swing (Chart 97). With some effort we can match each phase in ton-miles with one of opposite character in unit revenue, except in 1911–13, when a full cycle in average earnings roughly corresponds to the physical expansion. (The brief rise in revenue per ton-mile in 1936 may fairly be regarded as a minor interruption of a downward movement.) But to do this we must sometimes link phases of greatly different length. We must regard the traffic expansion of 1927–29 as corresponding to a much longer earnings contraction; as a corollary we must pair the long ton-mile contraction of 1929–32 with a very brief rise in earnings toward its

Table 80

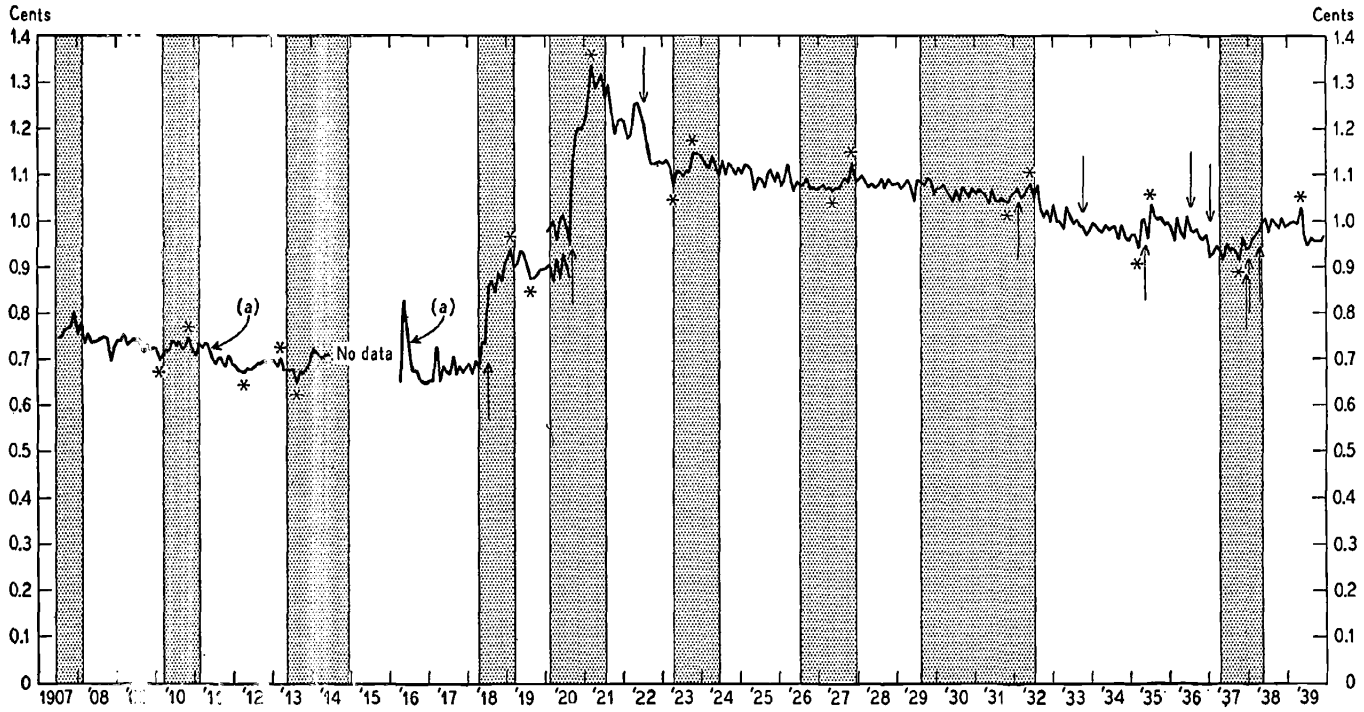
Revenue per Ton-mile

Change per Year between Peaks and Troughs in Ton-miles, 1893–1910

| Date of turn | 1893 | 1894 | 1896 | 1897 | 1907 | 1908 | 1910 |
|---|---|---|---|---|---|---|---|
| Level of ton-miles | Peak | Trough | Peak | Trough | Peak | Trough | Peak |
| Years from preceding date | ... | 1 | 2 | 1 | 10 | 1 | 2 |
| Revenue per ton-mile (cents) | | | | | | | |
| Amount | .878 | .860 | .806 | .798 | .759 | .754 | .753 |
| Change from preceding date | | | | | | | |
| Total | ... | −.018 | −.054 | −.008 | −.039 | −.005 | −.001 |
| Per Year | | | | | | | |
| To peak from trough | ... | ... | −.027 | ... | −.004 | ... | −.000 |
| To trough from peak | ... | −.018 | ... | −.008 | ... | −.005 | ... |
| Conformity suggested by comparison with preceding change per month; e.g., −.027 with −.018 | | | Inverse | Inverse | Positive | Positive | Positive |

CHART 97

Freight Revenue per Ton-mile, July 1907—December 1939

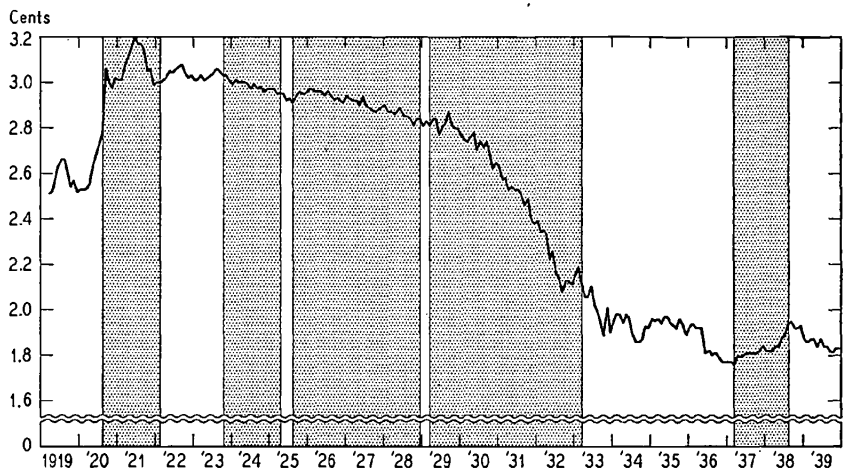



Shaded periods are contractions in ton-miles.
Arrows indicate first month in which general increases (↑) or decreases (↓) of freight rates were effective throughout the month.
(a) Non-revenue ton-miles included in divisor.

end. Before 1908 it is hardly possible to pair cycles in annual average freight receipts with those in ton-miles (Chart 96).

CHART 98

Passenger Revenue per Passenger-mile, March 1919—December 1939




Shaded periods are contractions in passenger-miles

Passenger-revenue per passenger-mile, in the period covered by monthly data, fell in 2 of 4 expansions in travel, 3 of 5 contractions (Table 81). In this period comparisons of the usual kind do not consistently indicate either kind of conformity. On the other hand, 6 of 8 comparisons among earlier phases would count in favor of inverse conformity. In the two exceptional instances, moreover, the circumstances are peculiar. The positive score yielded by comparing 1914–15 with 1912–14 rests upon a minute difference in the rate of change. Most of the rapid increase in 1915–20 occurred at the time of the general increase in June 10, 1918, made in what was actually a specific contraction (Ch. 2), concealed here by annual data.[3] We feel unable to mark off any specific cycles in unit passenger revenue in the period for which there are monthly figures (Chart 98), and if we were to mark off any before that, most of them would be extremely mild (Chart 99).

[3] On the other hand, 2 of the 6 inverse scorings are suspect, because they depend on data for the long period 1897–1911. Annual figures force us to treat it as a single expansion, although we know that monthly data would disclose several briefer phases; comparisons involving the latter might yield some positive scores.

Table 81

Revenue per Passenger-mile: Change per Month, 1920–38, and per Year, 1894–1922, between Peaks and Troughs in Passenger-miles

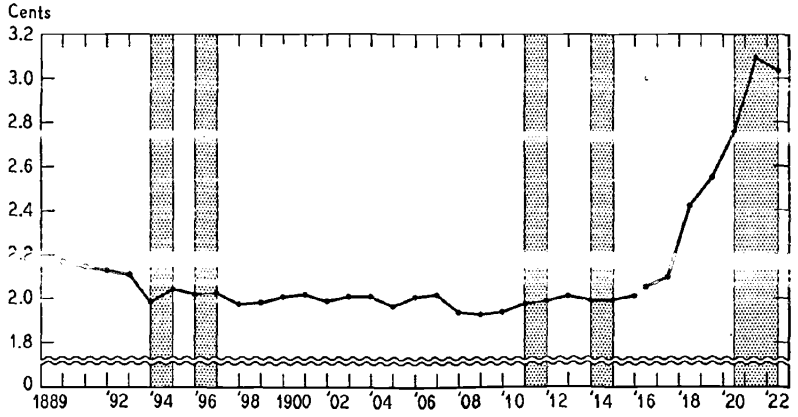
| Turn in passenger-miles | | Months or years from prec. date | Revenue per p-m.[a] | Change from preceding date | | | Conformity suggested[b] |
|---|---|---|---|---|---|---|---|
| | | | | Total | Per month or year | | |
| Date | Level | | | | To peak from trough | To trough from peak | |
| | | | (cents) | | | | |
| | | Months | | | Per month | | |
| Aug. 1920 | Peak | .. | 2.85 | ... | ... | ... | ... |
| Feb. 1922 | Trough | 18 | 3.00 | .15 | ... | .008 | ... |
| Oct. 1923 | Peak | 20 | 3.04 | .04 | .002 | ... | Inverse |
| Apr. 1925 | Trough | 18 | 2.95 | −.09 | ... | −.005 | Positive |
| Aug. 1925 | Peak | 4 | 2.93 | −.02 | −.005 | ... | None |
| Dec. 1928 | Trough | 40 | 2.83 | −.10 | ... | −.002 | Inverse |
| Mar. 1929 | Peak | 3 | 2.83 | .00 | .000 | ... | Positive |
| Mar. 1933 | Trough | 48 | 2.12 | −.71 | ... | −.015 | Positive |
| Mar. 1937 | Peak | 48 | 1.78 | −.34 | −.007 | ... | Positive |
| Aug. 1938 | Trough | 17 | 1.93 | .15 | ... | .009 | Inverse |
| | | Years | | | Per year | | |
| 1894 | Peak | .. | 1.986 | ... | ... | ... | ... |
| 1895 | Trough | 1 | 2.040 | .054 | ... | .054 | ... |
| 1896 | Peak | 1 | 2.019 | −.021 | −.021 | ... | Inverse |
| 1897 | Trough | 1 | 2.022 | .003 | ... | .003 | Inverse |
| 1911 | Peak | 14 | 1.974 | −.048 | −.003 | ... | Inverse |
| 1912 | Trough | 1 | 1.987 | .013 | ... | .013 | Inverse |
| 1914 | Peak | 2 | 1.990 | .003 | .002 | ... | Inverse |
| 1915 | Trough | 1 | 1.991 | .001 | ... | .001 | Positive |
| 1920 | Peak | 5.5 | 2.755 | .764 | .139 | ... | Positive |
| 1922 | Trough | 2 | 3.037 | .282 | ... | .141 | Inverse |

[a] Three-month average, 1920–38 section; date of turn is middle month.

[b] By comparison with preceding rate; e.g., .002 with .008.

CHART 99

Passenger Revenue per Passenger-mile, 1890–1922




Shaded periods are contractions in passenger-miles.

*It did conform positively to business in earlier times*

Advocates of various theories about cyclical price changes presumably do not have cycles in railroad traffic specifically in mind. It may be more appropriate to examine the changes during phases dated in the light of a more general view of the economy, such as those marked out by the reference chronology. Our comparisons for phases of traffic start in the middle '90's, since the annual data indicate no earlier cycles in traffic itself. Beginning about that time, unit revenue was related to the reference chronology in much the same way as it was to waves in traffic (Table 82). Revenue per passenger-mile showed little conformity of either kind, revenue per ton-mile conformed inversely, revenue per traffic unit perhaps also conformed inversely but less consistently.

Before the middle '90's, however, conformity was on the whole positive, especially in freight rates. This does not mean that the railway companies increased their freight charges in the earlier business expansions. On the contrary, rates fell in both expansion and contraction (Table 84), but more rapidly in the latter.

*Restricted competition may have altered conformity*

The disappearance of positive conformity may have been a consequence of the Interstate Commerce Act of 1887 and strengthening amendments in 1903 and 1906, together with the growth of restrictive practices among the railroads themselves. The law required that rates be public and nondiscriminatory. A railway traffic official who wished to make a concession to a necessitous, insistent or important customer must now either violate the law or advertise any change to competing roads and shippers. The position of the latter in demanding corresponding treatment was greatly strengthened, and the incentive to favor any one patron correspondingly weakened. Prior to 1887 the carriers had relied mainly on pooling of traffic, or of the revenue derived from it, in fixed proportions, to control competition among themselves. Such arrangements were outlawed by the Act. The companies turned to direct control of rates, forming associations to which each member reported in advance any proposed change. In 1897 the Supreme Court found the operations of such an organization contrary to the Sherman Anti-Trust Act. But eventually—how soon is not clear—the railroads interpreted the judgment as applying

Table 82

Unit Revenue

Conformity Suggested by Comparisons of Adjoining Reference Phases

| Terminal date of second phase† | Operating revenue per traffic unit (Table 83) | | Freight revenue per ton-mile (Table 84) | | Passenger revenue per passenger-mile (Table 85) | |
|---|---|---|---|---|---|---|
| | Annual data | Monthly data | Annual data | Monthly data | Annual data | Monthly data |
| 1871 | | | Inverse | | | |
| 1873 | | | Positive | | | |
| 1878 | | | Positive | | | |
| 1882 | | | Positive | | | |
| 1885 | | | Positive | | | |
| 1887 | Positive | | Positive | | Positive | |
| 1888 | Positive | | Positive | | Positive | |
| 1890 | Positive | | Positive | | Inverse | |
| 1891 | Inverse | | Inverse | | Inverse | |
| 1893 | Positive | | Positive | | Positive | |
| 1894 | Positive | | Positive | | Positive | |
| 1896 | Positive | | Inverse | | Positive | |
| 1897 | Inverse | | Inverse | | Positive | |
| 1900 | Inverse | | Inverse | | Inverse | |
| 1901 | Inverse | | Inverse | | Inverse | |
| 1903 | Inverse | | Inverse | | Inverse | |
| 1904 | Inverse | | Inverse | | Inverse | |
| 1907 | Inverse | | Inverse | | Inverse | |
| 1908 | Positive | | Inverse | | Positive | |
| 1910 | Positive | | Positive | | Positive | |
| 1911 | | Positive | | Positive | Inverse | |
| 1913 | | Inverse | | Positive | Inverse | |
| 1915 | | Inverse | Inverse | | Positive | |
| 1918 | | Positive | Positive | | Positive | |
| 1919 | | Inverse | Inverse | | Inverse | |
| 1920 | | Inverse | | Inverse | Positive | |
| 1921 | | Inverse | | Inverse | | Inverse |
| 1923 | | Inverse | | Inverse | | Inverse |
| 1924 | | Inverse | | Inverse | | Inverse |
| 1926 | | Inverse | | Inverse | | Positive |
| 1927 | | Inverse | | Inverse | | None |
| 1929 | | Positive | | Inverse | | Inverse |
| 1932 | | Positive | | Inverse | | Positive |
| 1937 | | Positive | | Positive | | Positive |
| 1938 | | Inverse | | Inverse | | Inverse |
| 1871–1894 | | | | | | |
| No. Positive | 5 | | 9 | | 4 | |
| No. Inverse | 1 | | 2 | | 2 | |
| 1896–1938 | | | | | | |
| No. Positive | 8 | | 5 | | 10 | |
| No. Inverse | 16 | | 19 | | 13 | |

† For monthly data, terminal month is in 1912 rather than 1911, 1914 rather than 1915, 1933 rather than 1932.

Table 83

Operating Revenue per Traffic Unit: Change per Month, 1908–38, and per Year, 1882–1910, between Reference Peaks and Troughs

| Reference date | Level of business | Months or years from prec. date | Revenue per traffic unit[a] | Change from preceding date | | | Conformity suggested[b] |
|---|---|---|---|---|---|---|---|
| | | | | Total | Per month or year | | |
| | | | | | To peak from trough | To trough from peak | |
| | | | (cents) | | | | |
| | | Months | | | Per month | | |
| June 1908 | Trough | ... | .7987 | ... | ... | ... | ... |
| Jan. 1910 | Peak | 19 | .8366 | .0379 | .0020 | ... | ... |
| Jan. 1912 | Trough | 24 | .8482 | .0116 | ... | .0005 | Positive |
| Jan. 1913 | Peak | 12 | .8057 | −.0425 | −.0035 | ... | Inverse |
| Dec. 1914 | Trough | 23 | .8160 | .0103 | ... | .0004 | Inverse |
| Aug. 1918 | Peak | 44 | 1.0694 | .2534 | .0058 | ... | Positive |
| Apr. 1919 | Trough | 8 | 1.1175 | .0481 | ... | .0060 | Inverse |
| Jan. 1920 | Peak | 9 | 1.1697 | .0522 | .0058 | ... | Inverse |
| Sept. 1921 | Trough | 20 | 1.3741 | .2044 | ... | .0102 | Inverse |
| May 1923 | Peak | 20 | 1.2345 | −.1396 | −.0070 | ... | Inverse |
| July 1924 | Trough | 14 | 1.2656 | .0311 | ... | .0022 | Inverse |
| Oct. 1926 | Peak | 27 | 1.2231 | −.0425 | −.0016 | ... | Inverse |
| Dec. 1927 | Trough | 14 | 1.2090 | −.0141 | ... | −.0010 | Inverse |
| June 1929 | Peak | 18 | 1.2114 | .0024 | .0001 | ... | Positive |
| Mar. 1933 | Trough | 45 | 1.0891 | −.1223 | ... | −.0027 | Positive |
| May 1937 | Peak | 50 | .9889 | −.1002 | −.0020 | ... | Positive |
| May 1938 | Trough | 12 | 1.0450 | .0561 | ... | .0047 | Inverse |
| | | Years | | | Per year | | |
| 1882 | Peak | .. | 1.3317 | ... | ... | ... | ... |
| 1885 | Trough | 3 | 1.0753 | −.2564 | ... | −.0855 | ... |
| 1887 | Peak | 2 | 1.0700 | −.0053 | −.0026 | ... | Positive |
| 1888 | Trough | 1 | 1.0286 | −.0414 | ... | .0414 | Positive |
| 1890 | Peak | 2 | .9863 | −.0423 | −.0211 | ... | Positive |
| 1891 | Trough | 1 | .9933 | .0070 | ... | .0070 | Inverse |
| 1890 | Peak | .. | 1.0040 | ... | ... | ... | ... |
| 1891 | Trough | 1 | .9789 | −.0251 | ... | −.0251 | ... |
| 1893 | Peak | 2 | .9545 | −.0244 | −.0122 | ... | Positive |
| 1894 | Trough | 1 | .9351 | −.0194 | ... | −.0194 | Positive |
| 1896 | Peak | 2 | .9072 | −.0279 | −.0140 | ... | Positive |
| 1897 | Trough | 1 | .8999 | −.0073 | ... | −.0073 | Inverse |
| 1900 | Peak | 3 | .8249 | −.0750 | −.0250 | ... | Inverse |
| 1901 | Trough | 1 | .8409 | .0160 | ... | .0160 | Inverse |
| 1903 | Peak | 2 | .8499 | .0090 | .0045 | ... | Inverse |
| 1904 | Trough | 1 | .8687 | .0188 | ... | .0188 | Inverse |
| 1907 | Peak | 3 | .8533 | −.0154 | −.0051 | ... | Inverse |
| 1908 | Trough | 1 | .8460 | −.0073 | ... | −.0073 | Positive |
| 1910 | Peak | 2 | .8445 | −.0015 | −.0008 | ... | Positive |

[a] Three-month average, 1908–38 section; reference date is middle month.

[b] By comparison with preceding rate, e.g., .0005 with .0020.

Table 84

Freight Revenue per Ton-mile: Change per Month, 1908–38, and per Year, 1868–1919, between Reference Peaks and Troughs

| Reference date | Level of business | Months or years from prec. date | Revenue per t-m.[a] | Change from preceding date | | | Conformity suggested[b] |
|---|---|---|---|---|---|---|---|
| | | | | Total | Per month or year | | |
| | | | | | To peak from trough | To trough from peak | |
| | | | (cents) | | | | |
| | | Months | | | Per month | | |
| June 1908 | Trough | ... | .735 | ... | ... | ... | ... |
| Jan. 1910 | Peak | 19 | .714 | −.021 | −.0011 | ... | ... |
| Jan. 1912 | Trough | 24 | .683 | −.031 | ... | −.0013 | Positive |
| Jan. 1913 | Peak | 12 | .691 | .008 | + | ... | Positive |
| Dec. 1914 | Trough | ... | [c] | ... | ... | ... | [d] |
| Aug. 1918 | Peak | ... | .857 | ... | ... | ... | [d] |
| Apr. 1919 | Trough | ... | .913 | .056 | ... | + | [d] |
| Jan. 1920 | Peak | ... | .899 | −.014 | − | ... | Inverse |
| Sept. 1921 | Trough | ... | 1.118 | .219 | ... | + | Inverse |
| May 1923 | Peak | ... | 1.017 | −.101 | − | ... | Inverse |
| Sept. 1921 | Trough | ... | 1.240 | ... | ... | ... | ... |
| May 1923 | Peak | ... | 1.096 | −.144 | − | ... | ... |
| July 1924 | Trough | ... | 1.109 | .013 | ... | + | Inverse |
| Oct. 1926 | Peak | ... | 1.079 | −.030 | − | ... | Inverse |
| Dec. 1927 | Trough | ... | 1.100 | .021 | ... | + | Inverse |
| June 1929 | Peak | 18 | 1.068 | −.032 | −.0018 | ... | Inverse |
| Mar. 1933 | Trough | 45 | .992 | −.076 | ... | −.0017 | Inverse |
| May 1937 | Peak | 50 | .935 | −.037 | −.0011 | ... | Positive |
| May 1938 | Trough | ... | .994 | .059 | ... | ... | Inverse |
| | | Years | | | Per year | | |
| 1868 | Trough | ... | 2.398 | ... | ... | ... | ... |
| 1869 | Peak | 1 | 2.153 | −.245 | −.245 | ... | ... |
| 1871 | Trough | 2 | 1.707 | −.446 | ... | −.223 | Inverse |
| 1873 | Peak | 2 | 1.641 | −.066 | −.033 | ... | Positive |
| 1878 | Trough | 5 | 1.051 | −.590 | ... | −.118 | Positive |
| 1882 | Peak | 4 | .945 | −.106 | −.026 | ... | Positive |
| 1885 | Trough | 3 | .827 | −.118 | ... | −.039 | Positive |
| 1882 | Peak | ... | 1.236 | ... | ... | ... | ... |
| 1885 | Trough | 3 | 1.057 | −.179 | ... | −.059 | ... |
| 1887 | Peak | 2 | 1.034 | −.023 | −.012 | ... | Positive |
| 1888 | Trough | 1 | .977 | −.057 | ... | −.057 | Positive |
| 1890 | Peak | 2 | .927 | −.050 | −.025 | ... | Positive |
| 1891 | Trough | 1 | .929 | .002 | ... | .002 | Inverse |
| 1890 | Peak | ... | .941 | ... | ... | ... | ... |
| 1891 | Trough | 1 | .895 | −.046 | ... | −.046 | ... |
| 1893 | Peak | 2 | .878 | −.017 | −.008 | ... | Positive |
| 1894 | Trough | 1 | .860 | −.018 | ... | −.018 | Positive |
| 1896 | Peak | 2 | .806 | −.054 | −.027 | ... | Inverse |
| 1897 | Trough | 1 | .798 | −.008 | ... | −.008 | Inverse |
| 1900 | Peak | 3 | .729 | −.069 | −.023 | ... | Inverse |
| 1901 | Trough | 1 | .719 | −.010 | ... | −.010 | Inverse |
| 1903 | Peak | 2 | .763 | .013 | .006 | ... | Inverse |
| 1904 | Trough | 1 | .780 | .017 | ... | .017 | Inverse |
| 1907 | Peak | 3 | .759 | −.021 | −.007 | ... | Inverse |

Table 84—*Concluded*

| Reference date | Level of business | Months or years from prec. date | Revenue per t-m.[a] | Change from preceding date | | | Conformity suggested[b] |
|---|---|---|---|---|---|---|---|
| | | | | Total | Per month or year | | |
| | | | | | To peak from trough | To trough from peak | |
| | | | (cents) | | | | |
| | | Years | | | Per year | | |
| 1908 | Trough | 1 | .754 | −.005 | ... | −.005 | Inverse |
| 1910 | Peak | 2 | .753 | −.001 | .000[e] | ... | Positive |
| 1911 | Trough | 1 | .757 | .004 | ... | .004 | [f] |
| 1913 | Peak | 2 | .729 | −.028 | −.014 | ... | [f] |
| 1915 | Trough | 2 | .735 | .006 | ... | .003 | Inverse |
| 1918 | Peak | 3.5 | .862 | .127 | .036 | ... | Positive |
| 1919 | Trough | 1 | .987 | .125 | ... | .125 | Inverse |

[a] Three-month average 1908–23, 1921–38 sections; reference date is middle month. Non-revenue ton-miles included in divisor, 1908–23 section.

[b] By comparison with preceding rate; e.g., −.0013 with −.0011.

[c] No data.

[d] See comparison on basis of annual data.

[e] More exactly, −.0005.

[f] See comparison on basis of monthly data.

only to agreements by which they bound themselves to accept the decision of the association, and perhaps to pay fines for noncompliance. They again began to give one another notice; competing roads at least had an opportunity to exercise persuasion. Meanwhile, some of the major roads started to buy the stock of their competitors on a large scale, apparently with control of rates as one objective, although some of the acquisitions were liquidated after a few years.[4]

*Effect of general rate proceedings*

Although restrictions on competition might account for the disappearance of positive, it is hard to see how it could actually cause inverse conformity, which is what we find, at least in freight service, for the most part from the 1890's onward. This kind of

[4] For a discussion of the legislation, associations, and combinations, see for example, Kent T. Healy *The Economics of Transportation in America* (Ronald Press, 1940), pp. 263–9, 381–92, and the court decisions and ICC investigations there cited; also Senate Committee on Interstate Commerce, *Railroad Combination in the Eastern Region, Part I (Before 1920)*, 76th Cong., 3d Sess., Senate Report 1182, 1940.

Table 85

Revenue per Passenger-mile: Change per Month, 1919–38, and per Year, 1882–1920, between Reference Peaks and Troughs

| Turn in passenger-miles | | Months or years from prec. date | Revenue per p-m.[a] | Change from preceding date | | | Conformity suggested[b] |
|---|---|---|---|---|---|---|---|
| | | | | Total | Per month or year | | |
| | | | | | To peak from trough | To trough from peak | |
| Date | Level | | (cents) | | | | |
| | | Months | | | Per month | | |
| Apr. 1919 | Trough | ... | 2.53 | ... | ... | ... | ... |
| Jan. 1920 | Peak | 9 | 2.53 | .00 | .000 | ... | ... |
| Sept. 1921 | Trough | 20 | 3.12 | .59 | ... | .030 | Inverse |
| May 1923 | Peak | 20 | 3.02 | −.10 | −.005 | ... | Inverse |
| July 1924 | Trough | 14 | 2.98 | −.04 | ... | −.003 | Inverse |
| Oct. 1926 | Peak | 27 | 2.92 | −.06 | −.002 | ... | Positive |
| Dec. 1927 | Trough | 14 | 2.89 | −.03 | ... | −.002 | None |
| June 1929 | Peak | 18 | 2.81 | −.08 | −.004 | ... | Inverse |
| Mar. 1933 | Trough | 45 | 2.12 | −.69 | ... | −.015 | Positive |
| May 1937 | Peak | 50 | 1.80 | −.32 | −.006 | ... | Positive |
| May 1938 | Trough | 12 | 1.85 | .05 | ... | .004 | Inverse |
| | | Years | | | Per year | | |
| 1882 | Peak | ... | 2.447 | ... | ... | ... | ... |
| 1885 | Trough | 3 | 2.199 | −.248 | ... | −.083 | ... |
| 1887 | Peak | 2 | 2.276 | .077 | .038 | ... | Positive |
| 1888 | Trough | 1 | 2.246 | −.030 | ... | −.030 | Positive |
| 1890 | Peak | 2 | 2.174 | −.072 | −.036 | ... | Inverse |
| 1891 | Trough | 1 | 2.184 | .010 | ... | .010 | Inverse |
| 1890 | Peak | ... | 2.167 | ... | ... | ... | ... |
| 1891 | Trough | 1 | 2.142 | −.025 | ... | −.025 | ... |
| 1893 | Peak | 2 | 2.108 | −.034 | −.017 | ... | Positive |
| 1894 | Trough | 1 | 1.986 | −.122 | ... | −.122 | Positive |
| 1896 | Peak | 2 | 2.019 | .033 | .016 | ... | Positive |
| 1897 | Trough | 1 | 2.022 | .003 | ... | .003 | Positive |
| 1900 | Peak | 3 | 2.003 | −.019 | −.006 | ... | Inverse |
| 1901 | Trough | 1 | 2.013 | .010 | ... | .010 | Inverse |
| 1903 | Peak | 2 | 2.006 | −.007 | −.004 | ... | Inverse |
| 1904 | Trough | 1 | 2.006 | .000 | ... | .000 | Inverse |
| 1907 | Peak | 3 | 2.014 | .008 | −.003 | ... | Inverse |
| 1908 | Trough | 1 | 1.937 | −.077 | ... | −.077 | Positive |
| 1910 | Peak | 2 | 1.938 | .001 | .000[c] | ... | Positive |
| 1911 | Trough | 1 | 1.974 | .036 | ... | .036 | Inverse |
| 1913 | Peak | 2 | 2.008 | .034 | .017 | ... | Inverse |
| 1915 | Trough | 2 | 1.991 | −.017 | ... | −.008 | Positive |
| 1918 | Peak | 3.5 | 2.421 | .430 | .123 | ... | Positive |
| 1919 | Trough | 1 | 2.548 | .127 | ... | .127 | Inverse |
| 1920 | Peak | 1 | 2.755 | .207 | .207 | ... | Positive |

[a] Three-month averages, 1919–38 section; reference date is middle month.

[b] By comparison with preceding rate, e.g., .030 with .000.

[c] More exactly, .0005.

conformity is explained in part by general rate changes, which became a conspicuous feature of the industry's price-making around the end of World War I and again in the great depression. They differ from ordinary rate-making activity by the roads and the ICC in that each applied more or less simultaneously to a wide range of commodities and the principal reason each was approved was the supposed need of the carriers for greater earnings, or, in 1922, the supposed need of the country for lower transportation charges as an aid to economic recovery. All except one of the general changes made for inverse conformity. Several months after a peak in business had been passed, freight rates were raised 25 to 40 percent, effective August 26, 1920.[5] Small increases were made on January 4, 1932, toward the end of the long contraction.[6] The ICC approved a series of rises in 1937–38.[7] On the other hand, the Commission ordered a general reduction of 10 percent effective July 1, 1922, about midway in a business expansion. The small increases made early in 1932 were still in effect at the beginning of the following long expansion. They were allowed to expire with September 30, 1933. New emergency increases became effective April 18, 1935 but were reduced on July 1, 1936 and expired altogether at the end of the year.[8] The net effect as between the beginning and end of the phase was the removal of the 1932 increases. The only general change that did not tend to promote inverse conformity was the 25 percent increase ordered by the Director-General of Railroads effective June 25, 1918, a few months before the reference peak in August. Even this change promoted inverse conformity to freight traffic, since the peak in ton-miles was reached in April. The other general changes bear the same relation to the specific phases in traffic as they do to those in business. They also invariably help account for specific phases in revenue per ton-mile (Chart 97).

Whatever chronology we use, however, several pairs of phases

[5] *Increased Rates, 1920*, 58 ICC 220.

[6] *Fifteen Percent Case, 1931*, 178 ICC 539, 179 ICC 215, 191 ICC 361. The opinion last cited (p. 365) indicates that even without allowance for subsequent reductions voluntarily made by the railroads to meet competition of other means of transport, they average only 2.6 percent on all freight traffic.

[7] *General Commodity Rate Increases, 1937*, 223 ICC 657; *Fifteen Percent Case*, 226 ICC 41.

[8] *Emergency Freight Charges, 1935*, 208 ICC 4, 215 ICC 439.

before World War I and during the 1920's suggest inverse conformity, although no general changes in rates occurred in them. We have no statistical test delicate enough to find the remainder of the explanation. It may lie in minor rate adjustments, in the varying composition of traffic, or in both. Rates per unit of weight are usually higher, for comparable hauls, on lightly loaded than on heavily loaded commodities. The inversely conforming relative importance of the lightly loaded articles makes for inversely conforming revenue per ton-mile.

### NO WAVE-LIKE CYCLES IN WAGE RATES

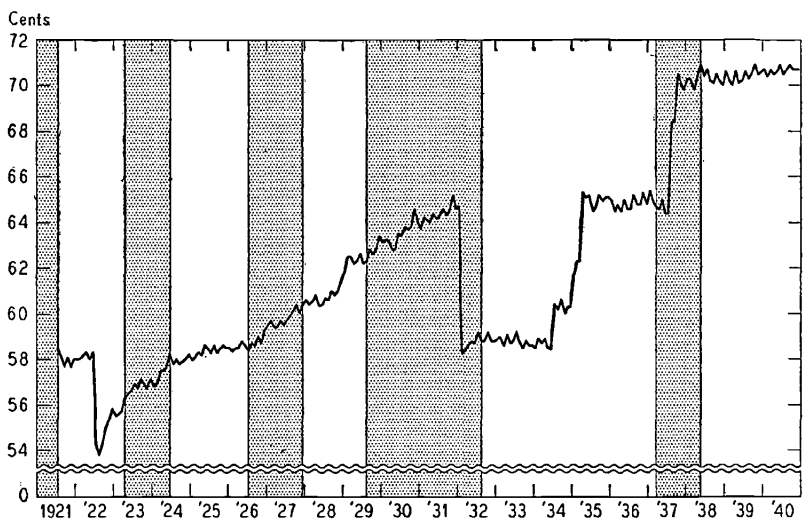
Railroad companies employ many kinds of workers and pay them at various rates. As in the case of freight charges, there is no comprehensive index. We cannot tell precisely how the aggregate bill a railroad would have to pay for a labor force of fixed size and composition has changed. Instead we must use a figure, average hourly earnings, computed by dividing the total payments for straight-time hours by the number of straight-time hours paid for. It is affected by changes in the rates specified in employment contracts. But it is affected by changes in the composition of the working force also. If, for example, employment of low-paid workers falls more drastically than employment of high-paid workers, the average will rise, even though no wage contract has been altered. On the other hand, since the figure is derived from straight-time data, it is not affected by changes in the proportion of overtime or of time paid for but not worked to total time. And in fact, it clearly reflects even rather minor general changes in wage rates. It pertains only to 'hourly' workers.

During the period covered by our data, wage rates were determined largely by collective bargaining, supplemented occasionally by the intervention of government agencies. The more important changes emerging from such proceedings have usually been nationwide, applicable to large groups of occupations, and concentrated on a single date or within a few months. Consequently, the national average shows abrupt variations. Many wage rates were cut in July 1922 in accordance with three decisions (Nos. 1028, 1036, 1074) by the Railway Labor Board. The average drops sharply in that month (Chart 100). Afterwards it rises gradually until the end of 1931. Up to 1929 this increase is

the result, in part at least, of various collective bargaining agreements, affecting sometimes one craft in one area, sometimes another craft in another area. The continued rise after 1929 must reflect a change in the composition of the labor force, as there were apparently no substantial increases in rates. Effective January 1, 1932, managers and workers agreed upon a 10 percent reduction in the contents of pay envelopes; the agreement was extended on the condition that the deduction was to become 7½ percent on July 1, 1934 and 5 percent on January 1, 1935, and was to cease on April 1, 1935. Finally, again by collective bargaining, wages in other than train and engine service were raised 5 cents an hour on August 1, 1937, and those in train and engine service approximately 5.5 cents on October 1.[9] All these readjustments are clearly reflected in Chart 100.

CHART 100

Straight-time Hourly Earnings, Occupations for which Hours are Reported, July 1921—December 1940




Shaded periods are contractions in traffic units.

[9] The history of wage rates is traced briefly by the Emergency Board appointed September 27, 1938 under Section 10 of the Railway Labor Act, *Report to the President*, pp. 3–7, and more fully by Harry E. Jones, *Wages and Labor Relations in the Railway Industry, 1900–1941* (Bureau of Information of the Eastern Railways), Part I.

If we ignore the abrupt intermediate changes and concentrate our attention on the beginning and end of phases, we find that there was a net rise in 3 of the 4 expansions, but also in 3 of the 4 contractions. A bare majority of the comparisons—4 of 7—indicate inverse conformity. One of the other 3 pertains to the cycle which, judged by either the changes in traffic or those in the economy at large, was the most violent of all—the peak-to-peak cycle 1929–37. It might be expected to provide the clearest of all examples of cyclical variation in wages; and wages fell in the contraction, rose in the expansion, i.e., conformed positively.

It should also be obvious from Chart 100 that wage rates did not follow any typical course within a phase. In the 1921–23 expansion they remained fairly stable for some months, then fell abruptly, then rose, but were well below their initial level at the end. This is quite unlike the course of events in 1924–26 and 1927–29, when wages rose more or less throughout the phase, and ended higher than at the beginning. None of these three phases is like 1932–37, when the average remained practically constant for many months, then rose abruptly in three quick steps, then again remained level for a long time. The diversity of pattern is equally striking in contractions. In each of the first two there was a roughly continuous rise. Such a rise characterized most of 1929–32, but toward the end there was an abrupt drop to a level below that at the traffic peak. In 1937–38 we find still another pattern: an abrupt rise shortly before the middle of the phase, and little variation at either end.

Workers and managers did not evolve national procedures for the negotiation of wages until the first World War. There were no abrupt countrywide changes. If we had data on average rates during earlier cycles they might show a more regular and perhaps positive relation to cycles in traffic or in business.

### PURCHASING POWER IN MAN-HOURS OF PRICES RECEIVED DECLINED MORE RAPIDLY IN EXPANSION

The sudden and abrupt alterations in the course of hourly earnings do not necessarily mean that the relation between the prices received by the industry for its services and the wage rates it paid followed the same jaggedly irregular course. Some of the general readjustments of wages were accompanied or closely followed by

more or less compensating general readjustments of charges for transportation. General reductions in freight rates became effective on July 1, 1922, the date of the wage changes. The restoration of wage rates to their pre-1932 level on April 1, 1935 was followed within the month by general advances in freight charges. The wage advances of August and October 1937 were followed during the winter by progressively broadening increases of rates. On the other hand, the reduction of wage rates on February 1, 1932 had been preceded on January 4 by increases in freight rates; in this instance both changes tended to widen the margin between prices and costs.

We may express the relation between prices received and wage rates in the form of a ratio, dividing receipts per 100 traffic units by the average payment for an hour of labor. In January 1923, for example, revenue per traffic unit was 1.2423 cents or 124.23 cents per 100 units. Average straight-time hourly earnings were 55.5 cents. The proceeds from the performance of 100 units of service could therefore pay for 124.23 ÷ 55.5 or 2.238 hours of labor. Such a ratio will rise from month to month if unit revenue goes up faster than hourly earnings, or goes up while they remain unchanged or decline, or if it declines less rapidly than hourly pay. If the latter rises relatively to unit revenue, the ratio will decline.

In fact the ratio tended to decline throughout the period 1921–38 (Chart 101). There was a net fall between the beginning and end of every phase (Table 86). The relation did, however, conform to cycles in traffic—inversely; with two exceptions the ratio fell more rapidly in expansion than in contraction. In 1923–24 it actually rose for a while, although the increase was subsequently lost. In 1929–32, on the other hand, it might have fallen more rapidly than in the preceding expansion if the freight rate and wage adjustments at the beginning of 1932 had not boosted the level for the rest of the phase.

The declines in the ratio of prices received to average hourly earnings were unfavorable to railway unit profits. If man-hours per traffic unit, materials used per traffic unit, and the ratio of unit revenue to materials prices had remained as they were in the initial stage, profit per dollar of revenue would have fallen in every phase, but more rapidly in the expansions. Profit per traffic unit

Table 86

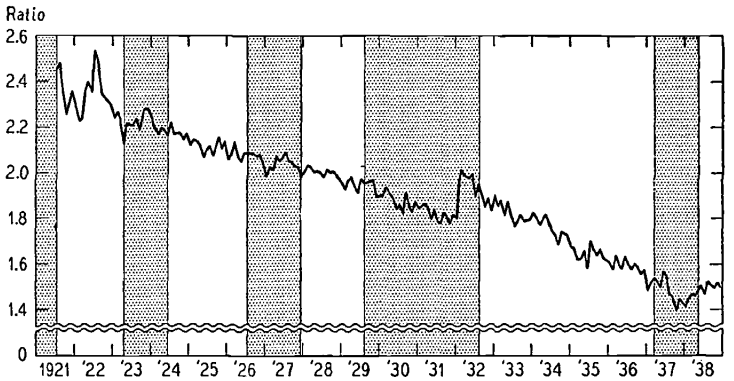
Ratio of Operating Revenue per 100 Traffic Units to Straight-time Hourly Earnings
Change per Month between Peaks and Troughs in Traffic Units, 1921–1938

| Date of turn | July 1921 | Apr. 1923 | June 1924 | July 1926 | Dec. 1927 | Aug. 1929 | Aug. 1932 | Mar. 1937 | May 1938 |
|---|---|---|---|---|---|---|---|---|---|
| Level of traffic units | Trough | Peak | Trough | Peak | Trough | Peak | Trough | Peak | Trough |
| Months from preceding date | ... | 21 | 14 | 25 | 17 | 20 | 36 | 55 | 14 |
| Ratio[a] | 2.466[b] | 2.194 | 2.190 | 2.089 | 2.004 | 1.960 | 1.917 | 1.523 | 1.481 |
| Change from preceding date | | | | | | | | | |
| Total | ... | −.272 | −.004 | −.101 | −.085 | −.044 | −.043 | −.394 | −.042 |
| Per month | | | | | | | | | |
| To peak from trough | ... | −.0130 | ... | −.0040 | ... | −.0022 | ... | −.0072 | ... |
| To trough from peak | ... | ... | −.0003 | ... | −.0050 | ... | −.0012 | ... | −.0030 |

[a] Three-month average; date of turn is middle month.
[b] Average for July and August only; no data for June.

CHART 101

Ratio of Revenue per 100 Traffic Units to Straight-time Hourly Earnings, July 1921—December 1938




Shaded periods are contractions in traffic units.

Table 87

Estimated Effect of Changes in Price-wage Relations on Profit per Traffic Unit, 1921–1938

Figures except column 5 in cents

| Phase of traffic units | Change in unit revenue[a] | Initial labor cost per traffic unit[b, c] | Straight-time hourly earnings | | | Change in | |
|---|---|---|---|---|---|---|---|
| | | | Initial stage[b, d] | Terminal stage[b, d] | Index of change (4) − (3) / (3) | Labor cost per traffic unit (2) × (5) | Unit profit (1) − (6) |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Expansions | | | | | | | |
| 1921–23 | −.2081 | .6780 | 58.2 | 56.2 | −.03 | −.0203 | −.1878 |
| 1924–26 | −.0432 | .6169 | 57.9 | 58.6 | .01 | .0062 | −.0494 |
| 1927–29 | .0148 | .5851 | 60.3 | 62.4 | .03 | .0176 | −.0028 |
| 1932–37 | −.1437 | .5534 | 58.9 | 64.7 | .10 | .0553 | −.1990 |
| Contractions | | | | | | | |
| 1923–24 | .0349 | .5724 | 56.2 | 57.9 | .03 | .0172 | .0177 |
| 1926–27 | −.0147 | .5537 | 58.6 | 60.3 | .03 | .0166 | −.0313 |
| 1929–32 | −.0939 | .5659 | 62.4 | 58.9 | −.06 | −.0340 | −.0599 |
| 1937–38 | .0588 | .4413 | 64.7 | 70.6 | .09 | .0397 | .0191 |

Col. 6 and 7 show what would have happened if unit revenue and hourly earnings had changed in each phase as they did, but man-hours per traffic unit and non-labor costs per traffic unit had remained constant.

[a] From Table 78.

[b] Average for three months (two in 1921) of initial or terminal stage.

[c] Computed from data for Chart 89.

[d] Computed from data for Chart 100.

would have fallen in all four expansions, but in only two contractions (Table 87).[10]

### PRICES PAID FOR RAILWAY SUPPLIES DID RISE AND FALL WITH BUSINESS AND TRAFFIC

Wages account for about 55 to 60 percent of railway operating expenses; amounts paid for commodities and services furnished to the railroads by business enterprises account for roughly 30–35 percent (Table 88, col. 1 and 3, Sec. C).[11]

There is nothing approaching a monthly index of prices paid by railroads until relatively recent times. In the familiar Bureau of Labor Statistics wholesale price indexes, however, we have a monthly record of prices paid by business men generally for the kind of things railroads use. The indexes for 'fuel and lighting', 'metals and metal products', and 'building materials' are of most interest from this point of view. Railroads cannot spend more than a minor percentage of their total outlay on commodities in the other seven main BLS categories. Broadly speaking, all three indexes have conformed simply and positively to cycles in traffic. Since 1908 venders of these articles at wholesale have charged higher prices at the end of each expansion than at its beginning, lower prices at each trough than at the preceding peak (Table 89). With data for each of three groups in each of 16 phases we have 48 instances in all; only 8 (marked E in the table) are exceptions to the rule. In no phase were the changes for all three groups exceptional.

The chances are that these indexes do not represent the movement of prices paid by railroads with any great exactness as to either percentage variation between turning points or relative rates of change in successive stages of a phase. The weights as-

[10] Let t = traffic units, l = man-hours (with an overtime hour counted as 1.5 hours), q = quantity of materials (in a broad sense), r = unit revenue, w = straight-time hourly earnings, p = price of materials. Then profit per dollar of revenue (before depreciation, rents, interest, etc.) = $(tr - lw - qp) \div tr = 1 - l/t \times w/r - q/t \times p/r$. Changes in it are opposite to those in any one of the ratios l/t, w/r, q/t, or p/r, provided the other three do not change. (The ratios w/r and p/r are the reciprocals of those discussed in the text.) Profit per traffic unit = $r - l/t \times w - q/t \times p$, and its direction of change cannot be determined from information about ratios alone.

[11] If we exclude depreciation, which does not represent current outlays, from expenses the percentages become somewhat higher (Sec. B of table).

Table 88

Charges to Operating Expenses

Peak and Trough Years in Traffic Units, 1921–1938

| | Employees' compensation (1) | Loss & damage, injuries to persons, insurance & pensions[a] (2) | Materials, supplies & misc.[b] (3) | Total operating expenses excl. depreciation (4) | Depreciation (5) | Total operating expenses incl. depreciation (6) | Train fuel & power[c] (7) | Total selected items[d] (8) |
|---|---|---|---|---|---|---|---|---|
| | | | A Amount (millions of dollars) | | | | | |
| 1921 | 2,590 | 170 | 1,653 | 4,413 | 150 | 4,563 | 453 | |
| 1923 | 2,785 | 123 | 1,821 | 4,729 | 166 | 4,895 | 451 | |
| 1924 | 2,625 | 121 | 1,581 | 4,327 | 181 | 4,508 | 373 | |
| 1926 | 2,718 | 127 | 1,622 | 4,467 | 202 | 4,669 | 348 | |
| 1928 | 2,630 | 119 | 1,464 | 4,213 | 215 | 4,428 | 306 | |
| 1929 | 2,674 | 125 | 1,487 | 4,286 | 220 | 4,506 | 291 | |
| 1932 | 1,437 | 84 | 688 | 2,209 | 194 | 2,403 | 152 | |
| 1937 | 1,865 | 76 | 983 | 2,924 | 195 | 3,119 | 234 | |
| 1938 | 1,660 | 57 | 803 | 2,520 | 202 | 2,722 | 205 | |
| | B Percentage of Total Expenses excluding Depreciation | | | | | | | (1) + (7) |
| 1921 | 58.7 | 3.9 | 37.5 | 100.0 | | | 10.3 | 69.0 |
| 1923 | 58.9 | 2.6 | 38.5 | 100.0 | | | 9.5 | 68.4 |
| 1924 | 60.7 | 2.8 | 36.5 | 100.0 | | | 8.6 | 69.3 |
| 1926 | 60.8 | 2.8 | 36.3 | 100.0 | | | 7.8 | 68.6 |
| 1928 | 62.4 | 2.8 | 34.7 | 100.0 | | | 7.3 | 69.7 |
| 1929 | 62.4 | 2.9 | 34.7 | 100.0 | | | 6.8 | 69.2 |
| 1932 | 65.1 | 3.8 | 31.1 | 100.0 | | | 6.9 | 72.0 |
| 1937 | 63.8 | 2.6 | 33.6 | 100.0 | | | 8.0 | 71.8 |
| 1938 | 65.9 | 2.3 | 31.9 | 100.0 | | | 8.1 | 74.0 |
| | C Percentage of Total Expenses including Depreciation | | | | | | | (1) + (5) + (7) |
| 1921 | 56.8 | 3.7 | 36.2 | | 3.3 | 100.0 | 9.9 | 70.0 |
| 1923 | 56.9 | 2.5 | 37.2 | | 3.4 | 100.0 | 9.2 | 69.5 |
| 1924 | 58.2 | 2.7 | 35.1 | | 4.0 | 100.0 | 8.3 | 70.5 |
| 1926 | 58.2 | 2.7 | 34.7 | | 4.3 | 100.0 | 7.5 | 70.0 |
| 1928 | 59.4 | 2.7 | 33.1 | | 4.9 | 100.0 | 6.9 | 71.2 |
| 1929 | 59.3 | 2.8 | 33.0 | | 4.9 | 100.0 | 6.5 | 70.7 |
| 1932 | 59.8 | 3.5 | 28.6 | | 8.1 | 100.0 | 6.3 | 74.2 |
| 1937 | 59.8 | 2.4 | 31.5 | | 6.3 | 100.0 | 7.5 | 73.6 |
| 1938 | 61.0 | 2.1 | 29.5 | | 7.4 | 100.0 | 7.5 | 75.9 |

[a] Total except pensions, 1921–32, taken from Bureau of Railway Economics, *Statistics of Railways of Class I, 1916–26*, and *1926–33*.

[b] Residual, (4) minus sum of (1) and (2). Must consist almost entirely of expenditures for commodities and services purchased from business enterprises, although small amounts not of that character—retirements of property and perhaps other items—are included.

[c] Includes cost of delivering to locomotives or rail motor cars. Does not include fuel and power for switching, heating buildings, etc. Part of the expenses in this column are included in (1) and the remainder in (3).

[d] Section B, (1) + (7); Section C, (1) + (5) + (7). As indicated by the preceding notes, these totals include a small amount of duplication.

Table 89

Unit Revenue and BLS Wholesale Price Indexes at Peaks and Troughs in Traffic Units, 1908–1938

| Turn in traffic units | | Revenue per 10,000 units ($) | Group indexes (1926: 100) | | | Purchasing power of revenue over | | | Index all commodities (1926: 100) | Purchasing power of commodities over railway service ($) ÷ (1) |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Level | (1) | Fuel & lighting (2) | Metals & metal products (3) | Building materials (4) | Fuel & lighting (1) ÷ (2) (5) | Metals & metal products (1) ÷ (3) (6) | Building materials (1) ÷ (4) (7) | (8) | (9) |
| June 1908 | Trough | 79.87 | 53.1 | 84.9 | 51.8 | 1.50 | .94 | 1.54 | 62.6 | .78 |
| Apr. 1910 | Peak | 84.09 | E 48.3 | 87.0 | 55.3 | E 1.74 | E .97 | 1.52 | 72.7 | .86 |
| Mar. 1912 | Trough | 84.10 | 47.1 | 82.1 | E 56.1 | 1.79 | 1.02 | E 1.50 | 64.1 | .76 |
| Feb. 1913 | Peak | 79.24 | 62.9 | 95.9 | 57.6 | 1.26 | .83 | 1.38 | 70.0 | .88 |
| Dec. 1914 | Trough | 81.60 | 52.0 | 78.0 | 50.6 | 1.57 | 1.05 | 1.61 | 67.6 | .83 |
| May 1918 | Peak | 88.21 | 108.8 | 132.4 | 97.7 | .81 | .67 | .90 | 128.5 | 1.46 |
| Mar. 1919 | Trough | 112.51 | 101.7 | 128.3 | E 99.0 | 1.11 | .88 | 1.14 | E 131.4 | 1.17 |
| Feb. 1920 | Peak | 114.55 | 123.6 | 147.0 | 162.6 | .93 | .78 | .71 | 157.8 | 1.38 |
| July 1921 | Trough | 144.01 | 84.2 | 117.0 | 94.3 | 1.71 | 1.23 | 1.53 | 93.4 | .65 |
| Apr. 1923 | Peak | 123.20 | 105.2 | E 111.8 | 114.0 | 1.17 | 1.10 | 1.08 | 103.4 | .84 |
| June 1924 | Trough | 126.69 | 91.9 | 104.4 | 101.4 | 1.38 | 1.21 | 1.25 | 95.5 | .75 |
| July 1926 | Peak | 122.37 | 100.3 | E 100.1 | E 99.5 | 1.22 | E 1.22 | 1.23 | 99.7 | .81 |
| Dec. 1927 | Trough | 120.90 | 84.2 | 95.7 | 91.9 | 1.44 | 1.26 | 1.32 | 96.4 | .80 |
| Aug. 1929 | Peak | 122.38 | E 82.7 | 100.6 | 95.4 | E 1.48 | 1.22 | 1.28 | E 96.3 | E .79 |
| Aug. 1932 | Trough | 112.99 | 71.7 | 79.8 | 69.9 | 1.58 | 1.42 | 1.62 | 65.0 | .58 |
| Mar. 1933 | Peak | 98.62 | 76.6 | 94.7 | 95.3 | 1.29 | 1.04 | 1.04 | 87.4 | .89 |
| May 1933 | Trough | 104.50 | 76.5 | E 96.4 | 90.4 | 1.37 | 1.08 | 1.16 | 78.4 | .75 |

All figures are three-month averages; date of turn is middle month. In computing columns 5, 6, 7, and 9 divisions were performed for each month separately and the three quotients averaged. E indicates exceptions to the rules stated in the text.

signed the various commodities doubtless do not closely reflect their importance in railway purchasing. The companies may buy many articles on long-term contracts and therefore at prices that do not change as quickly as those in spot markets. Nevertheless, it appears safe to conclude that the general direction is indicative; railways are faced with rising prices for the commodities they need in expansion and benefit from falling prices in contraction.

Table 90

Operating Revenue per 10,000 Traffic Units, BRE Index of Prices of Railway Materials, Supplies and Fuel, and Ratio of Former to Latter, May 1, 1933–December 1, 1938

| | Revenue per 10,000 units[a] (dollars) (1) | BRE index[b] (May 1933: 100) (2) | Ratio of (1) to (2) (3) |
|---|---|---|---|
| May 1, 1933 | 108.68 | 100.0 | 1.0868 |
| Feb. 1, 1934 | 106.62 | 114.5 | .9312 |
| Dec. 1, 1935 | 105.44 | 120.3 | .8765 |
| Oct. 1, 1936 | 103.12 | 124.0 | .8316 |
| Jan. 1, 1937 | 99.46 | 129.0 | .7710 |
| Apr. 1, 1937 | 98.84 | 142.6 | .6931 |
| Oct. 1, 1937 | 98.80 | 140.1 | .7052 |
| Dec. 1, 1937 | 100.86 | 137.2 | .7351 |
| June 1, 1938 | 105.34 | 133.6 | .7885 |
| Dec. 1, 1938 | 105.70 | 129.3 | .8175 |

[a] Average for month preceding and month following date.

[b] Letter from Julius H. Parmelee, Director, Bureau of Railway Economics, July 28, 1945.

For the most recent cycle we have more apposite evidence that this is true in the indexes prepared by the Bureau of Railway Economics and pertaining specifically to the industry it serves. Although the figures are not monthly the intervals between the dates to which they apply are fairly short. They show that prices of railway materials, fuel, and supplies rose steadily from May 1, 1933 to April 1, 1937, then fell to December 1, 1938 (Table 90).

The *Railway Age* has computed an annual index of prices paid by railroads, for 1914 and subsequent years. It rises in every expansion of traffic except 1924–26, falls in every contraction except 1918–19 (Table 91). Peaks and troughs in the index, when present, corresponded to those in traffic, except for a trough in 1922 rather than 1921, and another in 1933 rather than 1932.

Table 91

Operating Revenue per 10,000 Traffic Units, *Railway Age* Index of Prices of Railway Materials and Fuel, and Ratio of Former to Latter, 1914–1941

| | Level of traffic | Operating revenue per 10,000 units (dollars) (1) | Railway age index (1914: 100)[a] (2) | Ratio of (1) to (2) (3) |
|---|---|---|---|---|
| 1914 | Trough | 82.45[b] | 100 | .8245 |
| 1915 | | 82.58[b] | 107 | .7718 |
| 1916 | | 80.56 | 137 | .5880 |
| 1917 | | 81.86 | 177 | .4625 |
| 1918 | Peak | 95.88 | 212 | .4523 |
| 1919 | Trough | 107.87 | 216 | .4994 |
| 1920 | Peak | 117.87 | 236 | .4994 |
| 1921 | Trough | 138.78 | 187 | .7421 |
| 1922 | | 130.66 | 179 | .7299 |
| 1923 | Peak | 124.56 | 194 | .6421 |
| 1924 | Trough | 124.37 | 189 | .6580 |
| 1925 | | 122.16 | 184 | .6639 |
| 1926 | Peak | 120.44 | 183 | .6581 |
| 1927 | | 120.20 | 179 | .6715 |
| 1928 | Trough | 119.91 | 178 | .6737 |
| 1929 | Peak | 120.11 | 180 | .6673 |
| 1930 | | 117.72 | 173 | .6805 |
| 1931 | | 115.56 | 162 | .7133 |
| 1932 | Trough | 113.61 | 151 | .7524 |
| 1933 | | 107.13 | 149 | .7190 |
| 1934 | | 104.68 | 165 | .6344 |
| 1935 | | 105.58 | 167 | .6322 |
| 1936 | | 102.93 | 173 | .5950 |
| 1937 | Peak | 99.07 | 186 | .5326 |
| 1938 | Trough | 104.06 | 180 | .5781 |
| 1939 | | 102.84 | 175 | .5877 |
| 1940 | | 99.69 | 179 | .5569 |
| 1941 | | 97.85 | 189 | .5177 |

[a] *Railway Age*, Vol. 112, p. 82 (Jan. 3, 1942).

[b] There are no calendar year figures on revenue or traffic in *Statistics of Railways*. We obtained them by totaling monthly figures: revenue as reported by ICC, ton-miles as estimated by Babson, passenger-miles as estimated in Chapter 2. Passenger-miles converted to traffic units by multiplying by 2.430 (see Ch. 3). The same procedure applied to 1916 yields revenue per 10,000 units of $84.15 instead of $80.56. The decline from 1914–15 to 1916–18 in col. 3 is therefore probably somewhat exaggerated.

Before 1908 we have only the BLS figures. Since we are confined to annual data on revenue per traffic unit, we have stated the commodity indexes in annual form for comparison. They portray prices as rising in expansions, falling in contractions from 1893 to 1908 (Table 92). There were only 2 exceptions in 15 cases: prices of fuel and lighting rose in 1893–95 and in 1907–08.

Table 92

Revenue per 10,000 Traffic Units, BLS Wholesale Price Indexes, and Ratios, 1891–1908

Base of Four Indexes, 1926:100

| Year ended June 30 | Level of traffic units | Revenue per 10,000 units ($) (1) | Index fuel and lighting (2) | Ratio of (1) to (2) (3) | Index metals & metal products (4) | Ratio of (1) to (4) (5) | Index building materials (6) | Ratio of (1) to (6) (7) | Index all commodities (8) | Ratio of (8) to (1) (9) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1891 | | 97.89 | 37.4 | 2.62 | 100.8 | .97 | 46.1 | 2.12 | 57.1 | .58 |
| 1892 | | 97.25 | 35.6 | 2.73 | 86.8 | 1.12 | 42.3 | 2.30 | 53.1 | .55 |
| 1893 | Peak | 95.45 | 35.5 | 2.69 | 82.2 | 1.16 | 41.9 | 2.28 | 54.4 | .57 |
| 1894 | | 93.51 | 35.3 | 2.65 | 69.6 | 1.34 | 40.6 | 2.30 | 49.7 | .53 |
| 1895 | Trough | 93.83 | 37.0 | 2.54 | 64.4 | 1.46 | 39.0 | 2.41 | 48.4 | .52 |
| 1896 | Peak | 90.72 | 40.5 | 2.24 | 74.2 | 1.22 | 38.9 | 2.33 | 48.0 | .53 |
| 1897 | Trough | 89.99 | 37.0 | 2.43 | 68.2 | 1.32 | 38.2 | 2.36 | 46.1 | .51 |
| 1898 | | 85.24 | 32.7 | 2.61 | 64.5 | 1.32 | 36.5 | 2.21 | 48.3 | .57 |
| 1899 | | 82.70 | 36.9 | 2.24 | 77.7 | 1.06 | 40.5 | 2.04 | 49.1 | .59 |
| 1900 | | 82.49 | 46.9 | 1.76 | 108.1 | .76 | 46.5 | 1.77 | 55.6 | .67 |
| 1901 | | 84.09 | 43.8 | 1.92 | 91.3 | .92 | 44.5 | 1.89 | 55.0 | .65 |
| 1902 | | 84.31 | 45.2 | 1.87 | 92.2 | .91 | 44.6 | 1.89 | 56.7 | .67 |
| 1903 | | 84.99 | 61.0 | 1.39 | 92.7 | .92 | 46.4 | 1.83 | 60.3 | .71 |
| 1904 | | 86.87 | 56.2 | 1.55 | 83.6 | 1.04 | 45.9 | 1.89 | 59.1 | .68 |
| 1905 | | 85.40 | 50.3 | 1.70 | 83.5 | 1.02 | 45.4 | 1.88 | 60.0 | .70 |
| 1906 | | 84.10 | 50.9 | 1.65 | 94.7 | .89 | 51.6 | 1.63 | 60.5 | .72 |
| 1907 | Peak | 85.33 | 52.8 | 1.62 | 112.5 | .76 | 56.2 | 1.52 | 63.6 | .75 |
| 1908 | Trough | 84.60 | 54.5 | 1.55 | 93.8 | .90 | 54.3 | 1.56 | 63.8 | .75 |

Price indexes are straight averages of 12 monthly figures.

An examination of price changes between reference dates would reveal that they conform to business in much the same way as to traffic.

### CHANGES IN PRICE RELATIONS UNFAVORABLE TO RAILWAY PROFITS IN EXPANSION, FAVORABLE IN CONTRACTION

We conclude from foregoing sections that the prices the railroad companies charged for their services rose little if at all during ex-

pansions, while their suppliers did raise prices substantially in most cases. In contractions prices of commodities tumbled; unit revenue did not fall correspondingly.

The point of these comparisons may be emphasized by dividing the BLS indexes into revenue per traffic unit. The effect is to disclose at least roughly the changes in the purchasing power over commodities of the revenue derived from rendering a fixed and specified quantity of transportation services. A few specimen computations will make the process clear. The BLS index for metals and metal products may be thought of as telling us that a certain assortment of such articles could be bought for $100 in 1926. It tells us also what the same assortment of commodities in the same quantities would have cost at other dates. In August 1932, for example, the price of the batch would have been $80.10. Revenue per traffic unit was 1.1482 cents. The performance of 10,000 units of service brought the railroads a revenue of $114.82. With this sum they could have bought 114.82 ÷ 80.10 or 1.4335 assortments, batches, or 'baskets' of metals and metal products. In March 1937, 10,000 traffic units yielded a revenue of $99.33, considerably less than in 1932. Meanwhile the price of the assortment had risen to $96.00. Consequently, with the proceeds from the 10,000 units the railroads could buy only 99.33 ÷ 96.00 or 1.0347 'baskets' of metal articles.

Such computations for the three groups of commodities in sixteen phases suggest that the purchasing power of the revenue from 10,000 traffic units usually diminished in expansions and increased in contractions (Chart 102). Comparisons between the beginning and end of a phase indicate exceptions in only 5 of 48 instances (Table 89).

Similar ratios of unit revenue to the BRE index of prices paid show that the purchasing power from 10,000 units fell in the 1932–37 expansion and rose in the 1937–38 contraction (Table 90). Computations based on *Railway Age* data indicate the same thing for all phases covered except 1919–20 and 1924–26 (Table 91). Finally, calculations with the aid of the annual BLS data up to 1908 suggest the same conclusions, except with respect to fuel and lighting in 1893–95 and 1907–08 (Table 92).

Table 93

Estimated Effect of Changes in Price Relations on Profit per Traffic Unit, 1908–38, 1914–38, 1893–1908

Figures except column 3 in cents

| Phase of traffic units | Change in unit revenue (1) | Initial materials cost per traffic unit (2) | Index of change in material prices (3) | Change in: Materials cost per traffic unit (2) × (3) (4) | Change in: Unit profit (1) − (4) (5) |
|---|---|---|---|---|---|
| **A Estimates from BLS Indexes and Other Monthly Data** | | | | | |
| Expansions | | | | | |
| 1908–10 | .0422 | | .00 | None | Increase |
| 1911–13 | −.0486 | No | .18 | Increase | Decrease |
| 1914–18 | .0661 | data | .91 | Increase | Decrease[a] |
| 1919–20 | .0204 | | .34 | Increase | Decrease[a] |
| 1921–23 | −.2081 | .4657 | .14 | .0652 | −.2733 |
| 1924–26 | −.0432 | .3284 | .01 | .0033 | −.0465 |
| 1927–29 | .0148 | .2921 | .02 | .0058 | .0090 |
| 1932–37 | −.1437 | .2524 | .21 | .0530 | −.1967 |
| Contractions | | | | | |
| 1910–11 | .0001 | | −.02 | Decrease | Increase |
| 1913–14 | .0236 | No | −.16 | Decrease | Increase |
| 1918–19 | .2430 | data | −.03 | Decrease | Increase |
| 1920–21 | .2946 | | −.31 | Decrease | Increase |
| 1923–24 | .0349 | .3291 | −.10 | −.0329 | .0678 |
| 1926–27 | −.0147 | .2876 | −.09 | −.0259 | .0112 |
| 1929–32 | −.0939 | .2619 | −.20 | −.0524 | −.0415 |
| 1937–38 | .0588 | .2133 | −.01 | −.0021 | .0609 |
| **B Estimates from *Railway Age* Indexes and Other Annual Data** | | | | | |
| Expansions | | | | | |
| 1914–18 | .1343 | .2234 | 1.12 | .2502 | −.1159 |
| 1919–20 | .1000 | .3428 | .09 | .0309 | .0691 |
| 1921–23 | −.1422 | .4580 | .04 | .0183 | −.1605 |
| 1924–26 | −.0393 | .3575 | −.03 | −.0107 | −.0286 |
| 1928–29 | .0020 | .3104 | .01 | .0031 | −.0011 |
| 1932–37 | −.1454 | .2808 | .23 | .0646 | −.2100 |
| Contractions | | | | | |
| 1918–19 | .1199 | .2825 | .02 | .0056 | .1143 |
| 1920–21 | .2091 | .4317 | −.21 | −.0907 | .2998 |
| 1923–24 | −.0019 | .3849 | −.03 | −.0115 | .0096 |
| 1926–28 | −.0053 | .3300 | −.03 | −.0099 | .0046 |
| 1929–32 | −.0650 | .3082 | −.16 | −.0493 | −.0157 |
| 1937–38 | .0499 | .2515 | −.03 | −.0075 | .0574 |
| **C Estimates from BLS Indexes and Other Annual Data** | | | | | |
| Expansions | | | | | |
| 1895–96 | −.0311 | .2454 | .08 | .0196 | −.0507 |
| 1897–1907 | −.0466 | .2307 | .52 | .1200 | −.1666 |
| Contractions | | | | | |
| 1893–95 | −.0162 | No data | −.08 | Decrease | Increase[a] |
| 1896–97 | −.0073 | .2404 | −.06 | −.0144 | .0071 |
| 1907–08 | −.0073 | .2224 | −.06 | −.0133 | .0060 |

Table 93—Continued

Columns 4 and 5 show what would have happened if unit revenue and prices of materials had changed in each phase as they did, but materials used per traffic unit and labor cost per traffic unit had remained constant.

No comparisons based on the BRE price index are included above, since it is clear from the direction of change in unit revenue and prices paid that the net tendency of changes in the two was to reduce unit profit in the expansion, raise it in the contraction.

Derivation of column 1: Section A, from Table 78; B, computed from peak and trough data in Table 91, col. 1; C, from Table 78.

Column 2: A, operating expense, excluding depreciation, per traffic unit, initial stage, Table 97, minus labor cost per traffic unit, Table 87. B, computed from corresponding annual data, except that compensation of employees charged to capital account is excluded from computation.[b] C, similar to B, but depreciation is included in total expense and compensation charged to capital account in labor expense. On the propriety of using total expense minus labor expense as an approximate measure of materials expense, see Table 88.

Column 3: A, may be illustrated by computations for the 1911–13 expansion: BLS index of fuel and lighting (Table 89), initial stage 47.1, terminal stage 62.9, ratio terminal to initial 62.9 ÷ 47.1 = 1.34. Corresponding ratio for metals and products 1.17, building materials 1.03. Straight average of ratios, (1.34 + 1.17 + 1.03) ÷ 3 = 1.18. Index of change, 1.18 − 1.00 = .18. B, similar indexes computed from peak and trough data in Table 91, col. 2. C, similar to A, from annual BLS indexes in Table 92.

[a] Initial materials cost was certainly higher than .0726¢ in 1914–18 or .0600¢ in 1919–20, and probably higher than .2025¢ in 1893–95; any higher figure would yield a change in unit cost larger than the change in unit revenue.

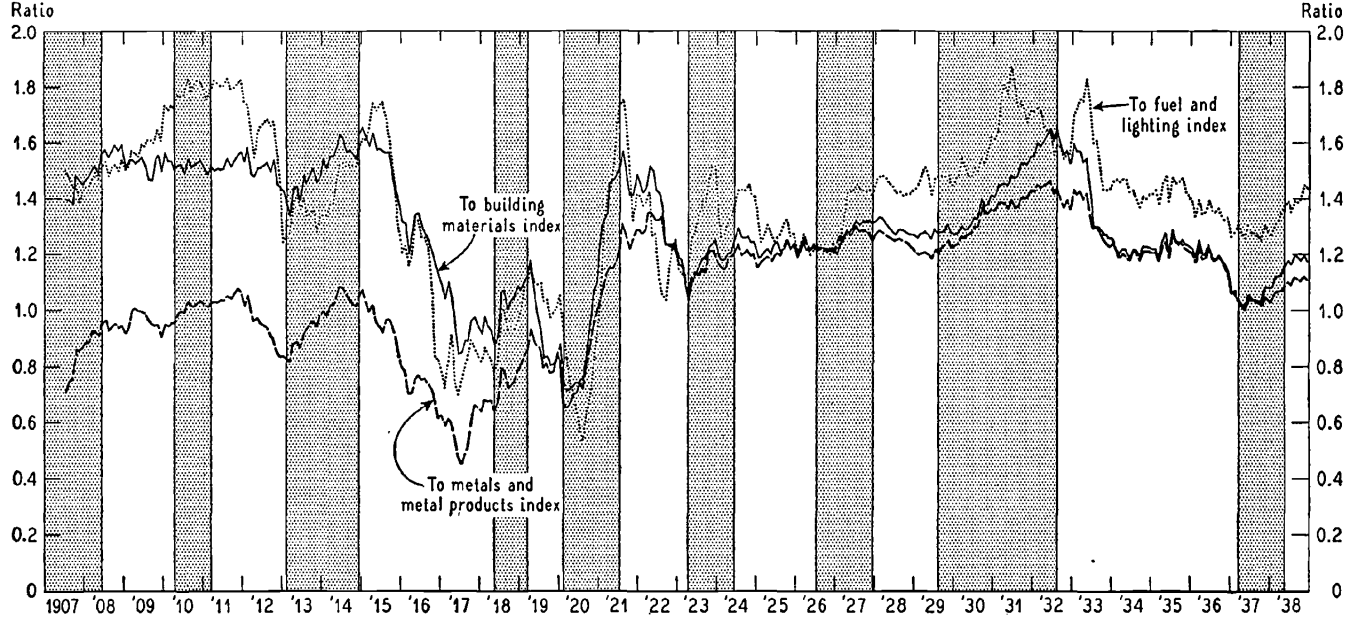
[b] Since a calendar year expense figure is needed for 1914, we have derived one from monthly data; cf. Table 91, note b.

The change in price relations tended to reduce railway profits in expansion. It meant that if the companies had to use the same quantities of commodities per unit of traffic at all times, materials expense per dollar of revenue would rise. If non-commodity elements of cost remained a constant percentage of revenue, profits per dollar of revenue would diminish. Conversely in contractions, changing price relations, if not offset by changes in other factors, might cause an increase in the profit ratio (cf. note 10).

If materials used per traffic unit and non-commodity expense per traffic unit had remained at their initial levels in each phase, the changes in unit revenue and in prices paid would have reduced profit per traffic unit in most expansions, raised it in most contractions (Table 93). Under these conditions, traffic must grow enough in expansion to offset the unfavorable net effect of the changes in prices received and paid, or aggregate profit would

CHART 102

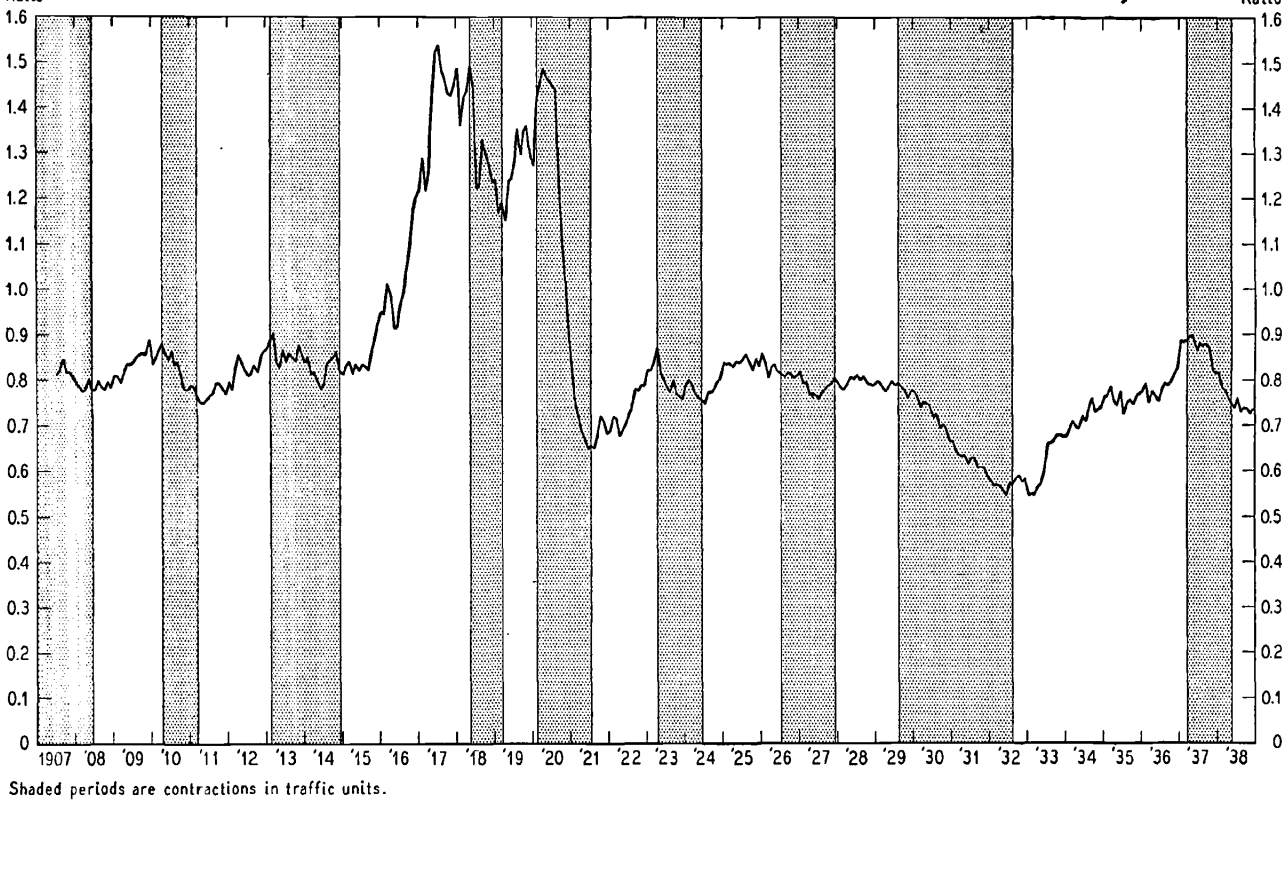
Ratio of Revenue per 10,000 Traffic Units (in dollars) to Three BLS Wholesale Price Indexes (1926:100), July 1907—December 1938




Shaded periods are contractions in traffic units.

CHART 103

Ratio of BLS Index of Wholesale Prices, All Commodities (1926:100) to Revenue per 10,000 Traffic Units (in dollars), July 1907—December 1938




Shaded periods are contractions in traffic units.

decline. Traffic must diminish enough in contraction to offset the favorable realignment of prices, or aggregate profit would increase.

### CHANGES FAVORABLE TO OTHER INDUSTRIES IN EXPANSION, UNFAVORABLE IN CONTRACTION

Not only prices of railway supplies but those of commodities in general have usually risen in expansion and fallen in contraction, absolutely and relatively to the prices of railway services. The cyclical change in the relation may be illustrated at least crudely by dividing the revenue from 10,000 units into the BLS wholesale index for all commodities (Chart 103). The ratio of prices to unit revenue increased in every expansion from 1908 to 1938, except 1927–29, diminished in every contraction (Table 89). Calculations from annual data indicate a similar relation from 1893 to 1907, although not in 1907–08 (Table 92). We infer that a typical business enterprise found its margin between the prices it received for its goods and its rail transport cost per unit of product widening in expansion and narrowing in contraction. Unit transport costs to an enterprise could rise, or fall, it is true, even if no railroad altered any rate or fare.[12] But we hazard the opinion that such possibilities were not ordinarily of enough consequence to offset the effects on margins suggested by our data.

The alternately favorable and adverse effects of inflexible rail rates on unit business profits may, of course, have been counterbalanced or more than counterbalanced by changes in nontransport elements of cost. In many industries, several of the latter are far more important.

[12] This could happen as a result of changes in the proportions in which different materials (some having low and some high transport costs) enter the productive process, resort to more distant or less distant sources for any one material, changes in the amount of business traveling per unit of product, substitution of Pullman for coach journeys or vice versa, redistribution of sales as between near and distant markets, diversion of traffic to or from non-rail transport, etc.